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OCT 15 2007

Appl. No. 10/520,563
Reply to Office action of 08/16/2007

Amendment to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1. (currently amended) A method for using a heat treatment atmosphere cocatalyst in an apparatus comprising heat treatment equipment or heat treatment-gas producing equipment having an atmosphere, the method comprising:

dissolving or dispersing the cocatalyst into a heat treatment atmosphere material to produce a combination, the cocatalyst existing in the form of a gas phase or a very fine dispersion in the heat treatment atmosphere material; and

diffusing ~~the cocatalyst~~ said combination into the atmosphere of the heat treatment equipment or heat treatment gas-producing equipment.

Claim 2. (previously presented) The method of claim 1 wherein the cocatalyst is diffused directly into the heat treatment atmosphere material in the form of a gas phase or a very fine dispersion, or the cocatalyst is dissolved or dispersed into a carrying agent to produce an admixture, and said admixture is fed into heat treatment equipment or heat treatment gas-producing equipment.

Claim 3. (cancelled) A kind of heat treatment atmosphere cocatalyst. The characteristic consists in that the cocatalyst keep in the form of gas phase or finer dispersion (such as mote), and diffuse into atmosphere material or atmosphere in heat treatment equipment or heat treatment gas-producing equipment.

Claim 4. (cancelled) The heat treatment atmosphere cocatalyst according to claim 3. The characteristic consists in that the cocatalyst is dispersed directly into heat treatment atmosphere material or heat treatment atmosphere in the form of gas phase or finer dispersion, or the cocatalyst is dissolved or dispersed into a kind of or kinds of carry material, then they are fed into heat treatment atmosphere material together in heat treatment equipment or gas-producing equipment.

Claim 5. (withdrawn and currently amended) A cocatalyst for a heat treatment atmosphere material, the cocatalyst comprising one two or more components selected from the group consisting of:

- a halogen element compound which takes 0.1-4% by weight in the heat treatment atmosphere material;

- a metal element compound which takes 0.0003-0.03% by weight in the heat treatment atmosphere material; and

- a nitrogen compound which takes 1-10% by weight in the heat treatment atmosphere material;

wherein said metal element compound is one or more than one compound selected from the group consisting of cobalt naphthenate, manganese naphthenate, nickel nitrate, manganese nitrate, ferrocene, and ferrocene ramification;

wherein said halogen element compound is one or more than one compound selected from the group consisting of chlorobenzene, trichlorobenzene, chlorotoluene, nitrochlorobenzene, trichloroethylene, ribromomethane, iodine, iodinated oil, iodomethane, freone, and tetrafluoroethylene;

wherein said nitrogen compound is one or more than one compound selected from the group consisting of p-amino-azobenzene hydrochloride, nitrobenzene, toluenediisocyanate, nitrochlorobenzene, trinitrobenzene, melamine, tricyanic acid, dicyandiamide, guanidine nitrate, cyclotrimethylenetrinitramine, pyridine, pyrazol, and pyraze; and

wherein said cocatalyst is capable of being maintained in the form of a gas phase or a very fine dispersion in the heat treatment atmosphere material.

Claim 6. (withdrawn) The heat treatment atmosphere cocatalyst according to claim 5, further comprising:

- a rare earth compound comprising lanthanum or cerium which takes 0.1-3% by weight in the heat treatment atmosphere material;

wherein said rare earth compound is selected from the group consisting of cerium naphthenate, lanthanum naphthenate, cerium nitrate, e lanthanum nitrate, lanthanum chloride, cerium chloride, lanthanum fluoride, and cerium fluoride.

Claim 7. (currently amended) A method for atmosphere heat treatment of a metal material, said method comprising:

- heat treating the metal material in a heat treatment atmosphere with a cocatalyst or an active heat treatment atmosphere produced by said cocatalyst;

wherein said cocatalyst is diffused into said heat treatment atmosphere in the form of a gas phase or a very fine dispersion, and releases a substance that activates the heat treatment atmosphere.

Claim 8. (cancelled) The kind of method of atmosphere heat treatment according to claim 7. The characteristic consists in the cocatalyst being dispersed directly into heat treatment atmosphere material or heat treatment atmosphere in the form of gas phase or finer dispersion. Or said cocatalyst said being dissolved or dispersed into a kind of or kinds of heat treatment atmosphere material as carry material, and fed into heat treatment gas-producing equipment or heat treatment equipment with carry material together.

Claim 9. (cancelled) The kind of method of atmosphere heat treatment in claim 7. The characteristic consists in how to use the cocatalyst in claim 5 or 6.

Claim 10. (cancelled) The method of atmosphere heat treatment in claim 7-9. The characteristic consist in using the cocatalyst, carburizing or carbonitriding can be processed in a higher obviously carbon potential, optimal selection: 0.25, better optimal selection: 0.15, or in lower obviously temperature, or in short obviously time than without said cocatalyst.

Claim 11. (cancelled) A kind of metal material heat treatment atmosphere. Wherein the atmosphere includes a kind of material cocatalyst which is diffused into said atmosphere in the form of gas phase or finer dispersion and release a kind of material which play a part catalysis and activation to said atmosphere in heat treatment gas-producing equipment or heat treatment equipment. Said cocatalyst is selected from the cocatalyst in claim 3 or 4.

Claim 12. (cancelled) A kind of method raising carbon potential and/or depressing the produce of carbon soot, or lowering process temperature in the atmosphere heat treatment of metal material. The characteristic consist in adding the cocatalyst in claim 3-6 into heat treatment atmosphere or heat treatment atmosphere material.

13. (withdrawn) The cocatalyst of claim 5 wherein the cocatalyst comprises at least one component selected from the group consisting of:

- a halogen element compound which takes 0.1-1% by weight in the heat treatment atmosphere material;

- a metal element compound which takes 0.0003-0.015% by weight in the heat treatment atmosphere material; and

- a nitrogen compound which takes 1-2% by weight in the heat treatment atmosphere material.

Claim 14. (withdrawn) The cocatalyst of claim 5 wherein:

- said metal element compound is at least one compound selected from the group consisting of: ferrocene, and ferrocene ramification;

said halogen element compound is at least one compound selected from the group consisting of: chlorobenzene, trichlorobenzene, chlorotoluene, and nitrochlorobenzene; and

said nitrogen compound is at least one compound selected from the group consisting of: p-amino-azobenzene hydrochloride, nitrobenzene, toluenediisocyanate, nitrochlorobenzene, trinitrobenzene, guanidine nitrate, and cyclotrimethylenetrinitramine.

Claim 15. (withdrawn and currently amended) A composition of matter for catalyzing a reaction in a heat treatment atmosphere, said composition of matter comprising at least one component two components selected from the group consisting of:

a halogen element compound which takes 0.1-4% by weight in the heat treatment atmosphere;

a metal element compound which takes 0.0003-0.03% by weight in the heat treatment atmosphere;

and

a nitrogen compound which takes 1-10% by weight in the heat treatment atmosphere;

wherein said metal element compound is at least one compound selected from the group consisting of: cobalt naphthenate, manganese naphthenate, nickel nitrate, manganese nitrate, ferrocene, and ferrocene ramification;

wherein said halogen element compound is at least one compound selected from the group consisting of: chlorobenzene, trichlorobenzene, chlorotoluene, nitrochlorobenzene, trichloroethylene, bromomethane, iodine, iodinated oil, iodomethane, freone, and tetrafluoroethylene;

wherein said said nitrogen compound is at least one compound selected from the group consisting of: p-amino-azobenzene hydrochloride, nitrobenzene, toluenediisocyanate, nitrochlorobenzene, trinitrobenzene, melamine, tricyanic acid, dicyandiamide, guanidine nitrate, cyclotrimethylenetrinitramine, pyridine, pyrazol, and pyraze; and

wherein said cocatalyst is capable of existing in the form of a gas phase or a very fine dispersion in the heat treatment atmosphere.

Claim 16. (previously presented) A method for making a heat treatment atmosphere, said method comprising: combining the composition of matter of claim 15 with a heat treatment atmosphere material.

Claim 17. (previously presented) A method for heating treating a metal, said method comprising: exposing the metal to the composition of matter of claim 15 in an apparatus comprising heat treatment equipment under conditions that are operative to achieve heat treatment.

Claim 18. (currently amended) A method for making a heat treatment atmosphere, said method comprising: combining the composition of matter of claim 15 with a carrying agent to produce a combination; and

dispersing the ~~carrying agent combination~~ in a heat treatment atmosphere material.

Claim 19. (currently amended) A method for heating treating a metal, said method comprising:

exposing the metal to the ~~a cocatalyst of claim 5~~ in an apparatus comprising heat treatment equipment containing heat treatment atmosphere material under conditions that are operative to achieve heat treatment;

said cocatalyst comprising two or more components selected from the group consisting of:
a halogen element compound which takes 0.1-4% by weight in the heat treatment atmosphere
material;

a metal element compound which takes 0.0003-0.03% by weight in the heat treatment
atmosphere material; and

a nitrogen compound which takes 1-10% by weight in the heat treatment atmosphere
material;

wherein said metal element compound is one or more than one compound selected from the group
consisting of cobalt naphthenate, manganese naphthenate, nickel nitrate, manganese nitrate, ferrocene, and
ferrocene ramification;

wherein said halogen element compound is one or more than one compound selected from the group
consisting of chlorobenzene, trichlorobenzene, chlorotoluene, nitrochlorobenzene, trichloroethylene,
ribromomethane, iodine, iodinated oil, iodomethane, freone, and tetrafluoroethylene;

wherein said nitrogen compound is one or more than one compound selected from the group
consisting of p-amino-azobenzene hydrochloride, nitrobenzene, toluenediisocyanate, nitrochlorobenzene,
trinitrobenzene, melamine, tricyanic acid, dicyandiamide, guanidine nitrate, cyclotrimethylenetrinitramine,
pyridine, pyrazol, and pyraze; and

wherein said cocatalyst is capable of being maintained in a gas phase or as a very fine dispersion in
said heat treatment atmosphere material.

Claim 20. (currently amended) A method for heating treating a metal, said method comprising:

exposing the metal to the ~~a heat treatment cocatalyst of claim 6~~ in an apparatus comprising heat
treatment equipment that contains a heat treatment atmosphere material under conditions that are operative to
achieve heat treatment;

said heat treatment cocatalyst comprising two or more components selected from the group consisting
of:

a halogen element compound which takes 0.1-4% by weight in said heat treatment
atmosphere material;

a metal element compound which takes 0.0003-0.03% by weight in said heat treatment
atmosphere material, and

a nitrogen compound which takes 1-10% by weight in said heat treatment atmosphere material;

wherein said metal element compound is one or more than one compound selected from the group consisting of cobalt naphthenate, manganese naphthenate, nickel nitrate, manganese nitrate, ferrocene, and ferrocene ramification;

wherein said halogen element compound is one or more than one compound selected from the group consisting of chlorobenzene, trichlorobenzene, chlorotoluene, nitrochlorobenzene, trichloroethylene, ribromomethane, iodine, iodinated oil, iodomethane, freone, and tetrafluoroethylene;

wherein said nitrogen compound is one or more than one compound selected from the group consisting of p-amino-azobenzene hydrochloride, nitrobenzene, toluenediisocyanate, nitrochlorobenzene, trinitrobenzene, melamine, tricyanic acid, dicyandiamide, guanidine nitrate, cyclotrimethylenetrinitramine, pyridine, pyrazol, and pyraze; and

said heat treatment cocatalyst further comprises:

a rare earth compound comprising lanthanum or cerium which takes 0.1-3% by weight in the heat treatment atmosphere material;

wherein said rare earth compound is selected from the group consisting of cerium naphthenate, lanthanum naphthenate, cerium nitrate, o lanthanum nitrate, lanthanum chloride, cerium chloride, lanthanum fluoride, and cerium fluoride; and

wherein said heat treatment cocatalyst is capable of being maintained in a gas phase or as a very fine dispersion in said heat treatment atmosphere material.

Claim 21 (new): The method of claim 7 wherein said heat treating step is carried out in heat treatment equipment having heat treatment gas-producing equipment and said cocatalyst is dissolved or dispersed into a carrying agent to produce a combination and said combination is fed into said heat treatment gas-producing equipment or heat treatment equipment.

Claim 22. (new) The method of claim 7 wherein said cocatalyst is the cocatalyst of claim 5.

Claim 23. (new) The method of claim 7 further comprising:

carburiizing or carbonitriding said metal material at a carbon potential, expressed in percent units, that is about 0.15 percent units to about 0.25 percent units higher than would be used in the absence of said cocatalyst.